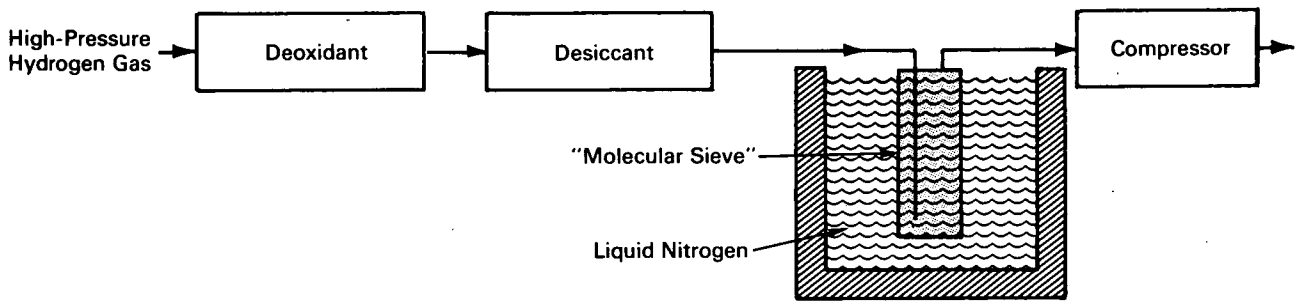
NASA TECH BRIEF

Purification Train Produces Ultrapure Hydrogen Gas



The problem:

To devise a continuous process for producing ultrapure hydrogen gas at 1000 psi from a commercially available supply (K-bottles) of high-purity hydrogen.

The solution:

A three-stage purification train incorporating a deoxidation unit, a dehydration (desiccation) unit, and a "molecular sieve".

How it's done:

The active components in the purification train, obtained from commercial sources, are packed in high-pressure vessels. The first vessel, the deoxidant unit, contains palladium black on an asbestos substrate which catalyzes the reaction of any free oxygen in the supply gas with an equivalent amount of hydrogen to form water vapor. The desiccant, barium oxide, in the second vessel absorbs the water vapor formed in the deoxidant unit. The "molecular sieve" is a bed of a powdered (0.001-inch particles) synthetic zeolite enclosed in a high-pressure vessel which is immersed in a liquid nitrogen bath. The zeolite at the temperature of liquid nitrogen absorbs all contaminant gases composed of molecules having a diameter greater than approximately 5 angstroms (molecular diameter of hydrogen = 2 angstroms). The equilibrium partial pressures of any of these gases over the zeolite are sufficiently low to ensure that the concentrations of each of these gases in the hydrogen product stream are less than 50 parts per billion.

Notes:

1. The deoxidant unit will remain effective over long periods of operation, without regeneration. The other two units must be periodically regenerated by heating. Parallel installations of these two units will enable in-place regeneration, without interruption of service.
2. Inquiries concerning this invention may be directed to:

   Technology Utilization Officer
   Marshall Space Flight Center
   Huntsville, Alabama 35812
   Reference: B67-10078

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

Source: R. J. Walter
of North American Aviation, Inc.
under contract to
Marshall Space Flight Center
(M-FS-1913)
Category 03